

## Chapter 2

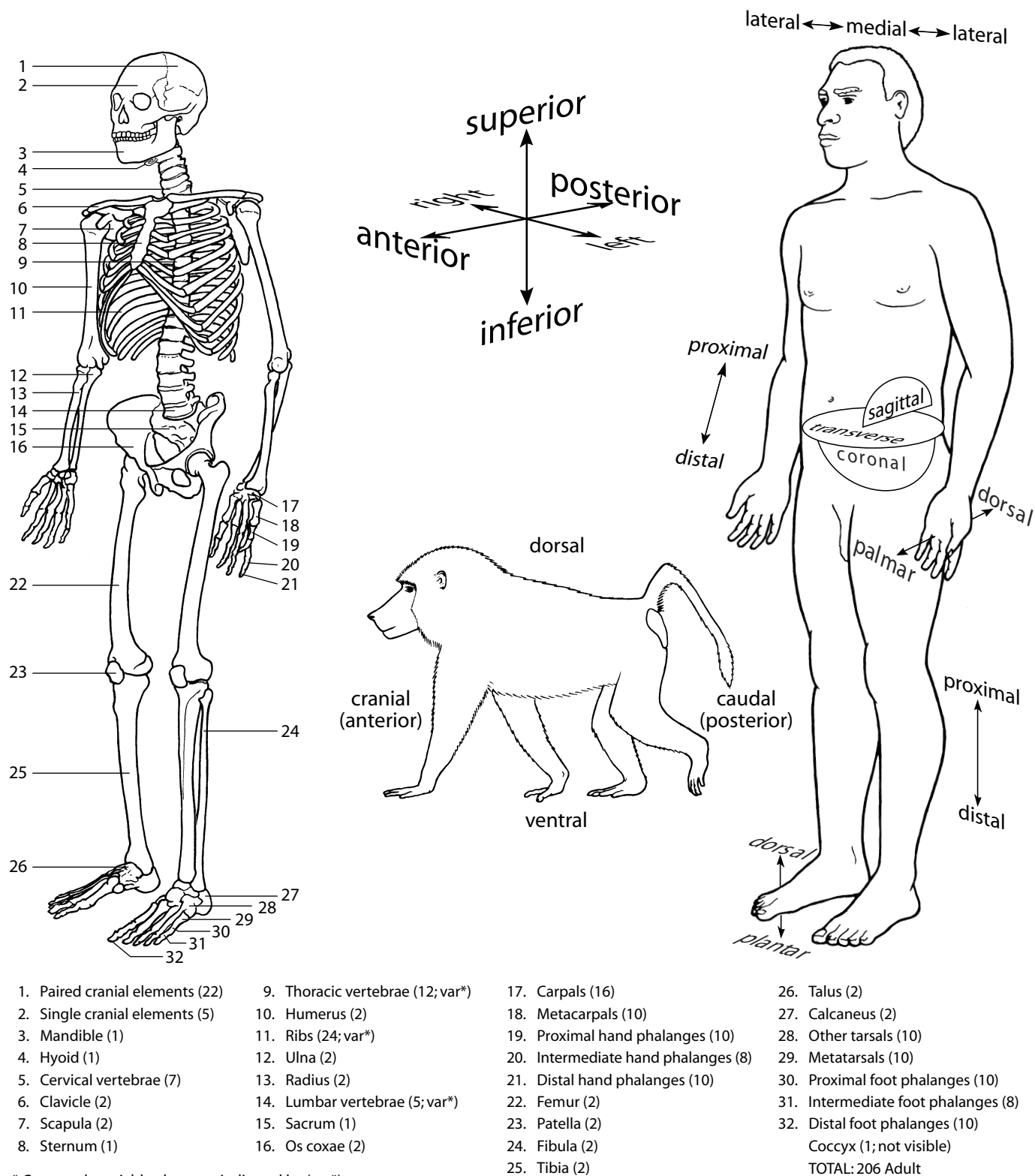
# ANATOMICAL TERMINOLOGY

**A**NATOMISTS AND ANTHROPOLOGISTS throughout the world use a specific vocabulary to describe the human body. Anatomical nomenclature is both concise and precise, allowing unambiguous communication among all researchers who study skeletal material. Indeed, it is virtually impossible to follow even basic descriptions or interpretations in paleontology, physical anthropology, medicine, human anatomy, and a variety of allied disciplines without a command of the basic, general anatomical terms introduced in this chapter. Here we define the essential planes of reference, directional terms, body motions, and bony formations necessary for the detailed study of human osteology. Because anatomical nomenclature has evolved from a classical foundation, and because many of the names used to describe bones and their parts are derived from Latin and Greek terms, we also include a section on roots, prefixes, and suffixes. Building on this foundation, we also offer sections on anatomical regions, shape-related terms, and age-related terms. A working knowledge of these terms will facilitate learning the names of bones and their parts.

Anatomical terminology for hominids assumes that the body is in what is called **standard anatomical position** (Figure 2.1). Standard anatomical position is that of a human standing, looking forward, feet together and pointing forward, arms alongside the trunk with palms facing forward and thumbs pointing away from the body. The result of this careful positioning is that none of the long bones are crossed from the viewer's perspective. The terms **left** and **right** refer to the sides of the individual being studied, not to the observer's own right or left sides. **Cranial** skeletal anatomy refers to the skull; the remainder of the skeleton is called **postcranial** anatomy. The **axial skeleton** refers to the bones of the trunk, including the vertebrae, sacrum, ribs, and sternum. The **appendicular skeleton** refers to the bones of the limbs, including the shoulder and pelvic girdles, and the hands and feet.

### 2.1 Planes of Reference

Three basic reference planes are used in human osteology. The **sagittal** (**midsagittal**, **median**, or **midline**) plane divides the body into symmetrical right and left halves. Any planar slice through the body that parallels the sagittal plane is called a **parasagittal section**. The **coronal** (**frontal**) plane passes through bregma (the intersection of the sagittal and coronal sutures; see Section 4.5.1) and divides the body into anterior and posterior halves and is placed at right angles to the sagittal plane. Any planar slice through the body that parallels the coronal plane is called a **paracoronal section**. A **transverse** (**horizontal**) plane slices through the body at any height but always passes perpendicular to the sagittal and frontal planes.



**Figure 2.1 Directional terms and planes for a human and a quadrupedal mammal.** Knowledge of the directional terms and planes of reference is necessary for any work in human anatomy. In human osteology, these terms are essential for the study and comparison of skeletal elements. Both the human body and human skeleton are presented in standard anatomical position: standing straight, facing straight ahead, arms at sides, palms and toes facing forward.

## 2.2 Directional Terms

In osteology it is useful to refer to directions of motion or the relative locations of various skeletal parts. All of the directional terms used here refer to the human body in standard anatomical position, but it is important to note that most of these terms are applicable to all mammals. A few terms may occasionally cause confusion when **hominid** (the zoological family of primates to which humans and their immediate ancestors and near-relatives belong) and nonhominid bones are being compared because humans are **orthograde** (trunk upright) bipeds and most other mammals are **pronograde** (trunk horizontal) quadrupeds.

### 2.2.1 General (Figure 2.1)

- a. **Superior:** toward the head end of the hominid body. The *superior* boundary of the human parietal bone is the sagittal suture. **Cephalic** and **cranial** are synonymous with superior in bipeds, and unlike superior, they can be used homologically for both bipeds and quadrupeds.
- b. **Inferior:** opposite of superior; for hominids, body parts away from the head. The *inferior* surface of the calcaneus, or heel bone, is the part of the bone that rests nearest to, or lies in contact with, the ground. **Caudal**, toward the tail, is often used in the description of quadrupedal anatomy.
- c. **Anterior:** toward the front of the hominid body. The breastbone, or sternum, is located *anterior* to the backbone, or vertebral column. **Ventral**, toward the belly, may be used homologically for bipeds and quadrupeds.
- d. **Posterior:** opposite of anterior; for hominids, toward the back of the individual. The occipital bone is on the *posterior* and inferior end of the skull. **Dorsal** is often used for homologous parts of the quadruped anatomy.
- e. **Medial:** toward the midline. The sternum is *medial* to the adjacent distal ribs.
- f. **Lateral:** opposite of medial; away from the midline. The thumb occupies a *lateral* position relative to the little finger in standard anatomical position.
- g. **Proximal:** nearest the axial skeleton, usually used for limb bones. The *proximal* end of the upper arm bone, the humerus, is the end toward the shoulder.
- h. **Distal:** opposite of proximal; farthest from the axial skeleton. The *distal* end of the terminal foot phalanx fits into the front end of a shoe.
- i. **External:** outer; closer to the surface. The rib cage is *external* to the lungs and heart.
- j. **Internal:** opposite of external; inner. The *internal* surface of the parietal is marked by a set of grooves made by blood vessels that lie external to the brain.
- k. **Extrinsic:** external to that which it acts upon. *Flexor pollicis longus*, a muscle that flexes the thumb, is considered an *extrinsic* hand muscle because the belly of the muscle is found deep in the forearm, not the hand itself.
- l. **Intrinsic:** internal to that which it acts upon. *Flexor pollicis brevis*, another muscle that flexes the thumb, is considered an *intrinsic* hand muscle because the muscle is located entirely in the hand.
- m. **Endocranial:** inner surface of the cranial vault. The brain fills the *endocranial* cavity.
- n. **Ectocranial:** outer surface of the cranial vault. The temporal line is on the *ectocranial* surface of the parietal.
- o. **Superficial:** closer to the surface. The ribs are *superficial* compared to the heart.
- p. **Deep:** opposite of superficial; far from the surface. The dentine core of a tooth is *deep* to the enamel.
- q. **Subcutaneous:** just below the skin. The anteromedial surface of the tibia is *subcutaneous*.

## 2.2.2 Hands and Feet (Figure 2.1)

- Palmar:** palm side of the hand. The *palmar* surfaces of the digits bear fingerprints.
- Plantar:** sole of the foot. The *plantar* surface of the foot contacts the ground during normal walking.
- Volar:** a general term, referring to the 'hollow' of either the hand or foot: in the hand, *volar* is synonymous with palmar, and in the foot, it is synonymous with plantar.
- Dorsal:** top of the foot or the back of the hand. The *dorsal* surfaces of hands and feet often bear hair, whereas the palmar and plantar surfaces do not.

## 2.2.3 Teeth (Figure 2.2)

- Mesial:** toward the midline point of the dental arch where the central incisors contact each other. The anterior portion of molar and premolar crowns and the medial parts of canines and incisors are called the *mesial* parts of these teeth. The *mesial* surface of the canine touches the incisor next to it, and the *mesial* surface of the first molar touches the premolar next to it.
- Distal:** opposite of mesial. The *distal* half of a premolar is the posterior half of the tooth.
- Lingual:** toward the tongue. The *lingual* surfaces of tooth crowns are usually hidden from view when a person smiles.
- Labial:** opposite of lingual; toward the lips; usually reserved for incisors and canines. The *labial* surfaces of incisors are observed when a person smiles.
- Buccal:** (pronounced 'buckle') opposite of lingual; toward the cheeks; usually reserved for premolars and molars. A wad of chewing tobacco is sometimes wedged between the cheek and the *buccal* surfaces of the molars of American baseball players.
- Interproximal:** the area of a tooth in contact with an adjacent tooth in the same jaw. Dental floss often gets stuck in *interproximal* areas.

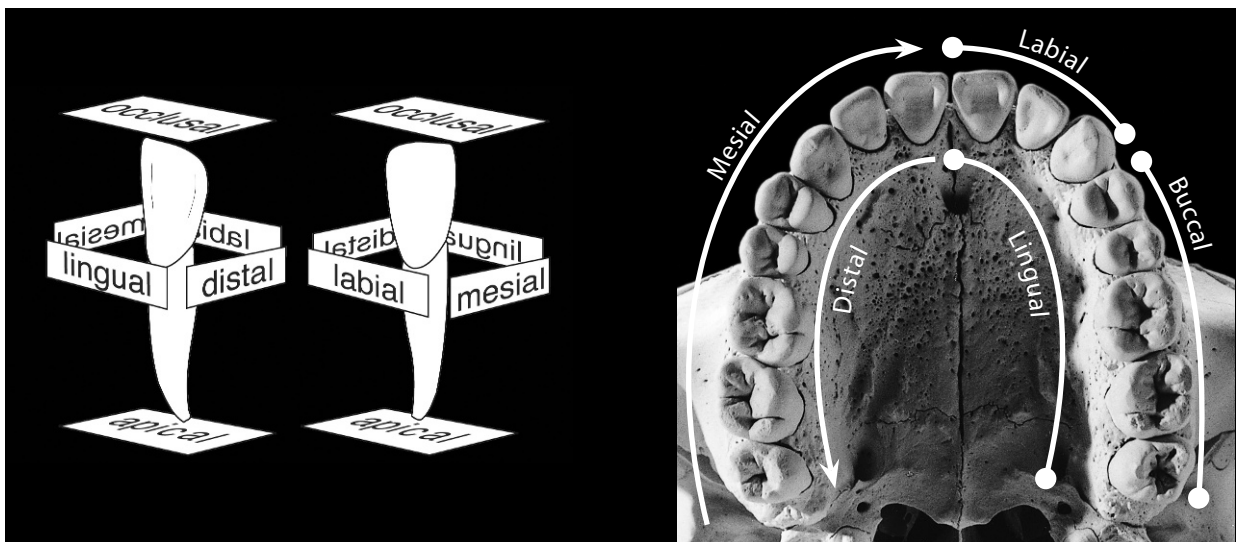


Figure 2.2 Directional terms and planes of reference for human teeth.

- g. **Occlusal:** facing the opposing dental arch, usually the chewing surface of each tooth. Caries (“cavities”) are often found on the irregular *occlusal* surfaces of the molar teeth.
- h. **Apical:** at or towards the tip of the root. Blood vessels enter the pulp cavity through an *apical* opening.
- i. **Cervical:** at, around, or pertaining to either the neck proper (the portion of the body between the head and shoulders) or to any of a number of anatomical constrictions referred to as ‘neck’ or ‘cervix.’ Dental plaque tends to build up along the *cervical* margins of teeth.
- j. **Incisal:** the biting, or occlusal, edge of the incisors. The *incisal* edges of the central incisors are used to bite into an apple.
- k. **Mesiodistal:** axis running from mesial to distal. The *mesiodistal* dimension of a molar may be reduced by interproximal wear.
- l. **Buccolingual** and **labiolingual:** axis running from labial or buccal to lingual. The incisors of Neanderthals often have large *labiolingual* dimensions.

## 2.3 Motions of the Body

Movement of the body is accomplished by muscles acting directly or via tendons on bones. The less mobile attachment point that anchors a muscle is called the **origin** of the muscle. The **insertion** is the site of muscle attachment with relatively more movement than the origin.

### 2.3.1 General

- a. **Flexion:** generally, a bending movement that decreases the angle between body parts. When a hand is clenched into a fist there is strong *flexion* of the phalanges on the metacarpal heads. By convention, *flexion* at the shoulder or hip joint refers to a ventral (forward) movement of the limb.
- b. **Extension:** opposite of flexion; a straightening movement that increases the angle between body parts. The classic karate chop is made by a rigid hand in which the fingers are extended. By convention, *extension* at the shoulder or hip joint is a dorsal (backward) swing of the limb.
- c. **Abduction:** movement of a body part, usually a limb, away from the sagittal plane. When the arm is raised to the side from standard anatomical position, *abduction* of the arm occurs. For the special case of fingers and toes, *abduction* is movement of the digit away from the midline of the hand or foot (spreading the digits).
- d. **Adduction:** opposite of abduction; movement of a body part, usually a limb, toward the sagittal plane. Bringing the arm down to slap the side of the thigh is *adduction*. For the special case of fingers and toes, *adduction* is movement of the digit toward the midline of the hand or foot (closing the digits).
- e. **Circumduction:** a combination of abduction and adduction, as well as flexion and extension, that results in an appendage being moved in a cone-shaped path. When the driver of a slow vehicle signals someone behind him to pass, this “waving on” is often done by *circumducting* the arm.
- f. **Rotation:** motion that occurs as one body part turns on an axis. The movement of the head of the radius on the distal humerus is an example of *rotation*.
- g. **Opposition:** motion in which body parts are brought together. *Opposition* of the thumb and finger tips allows us to grasp small objects.

### 2.3.2 Hands and Feet

- a. **Pronation:** rotary motion of the forearm that turns the palm from anteriorly facing (thumb lateral) to posteriorly facing (thumb medial). Typewriters are used with the hand in *pronation*.
- b. **Supination:** opposite of pronation; rotary motion of the forearm that returns the palm to a position in which the thumb is lateral. When chimpanzees beg for food the hand is often held in *supination*.
- c. **Dorsiflexion:** flexion of the anterior portion of the foot away from the ground. When a mime walks on her heels, her feet are *dorsiflexed*.
- d. **Plantarflexion** (or **volarflexion**): opposite of dorsiflexion; flexing of the anterior portion of the foot inferiorly, toward the ground at the ankle. Action in both dorsiflexion and plantarflexion occurs at the ankle. When a ballerina walks on her toes, her feet are strongly *plantarflexed*.
- e. **Eversion:** turning the sole of the foot outward so that it faces away from the midline of the body. Also known as **pronation** of the foot.
- f. **Inversion:** turning the sole of the foot inward so that it faces toward the midline of the body. Also known as **supination** of the foot.

## 2.4 General Bone Features

Whereas the directions and motions described in Sections 2.2 and 2.3 have very precise meanings, the series of general terms applied to bony features is more ambiguous and cross-cutting. For example: the theoretical question “when is a tubercle big enough to be called a tuberosity (or a trochanter)?” is rarely faced by the osteologist. This is because the conventional labels for various bones and bone parts are always adopted to ensure stability of nomenclature and effectiveness of communication. Specific terms for nearly all bones and their parts are already established, and have been for a long time. The “greater trochanter” of a femur, for example, identifies a particular, unique structure for all human osteologists. Recognize that the following terms are often vague by themselves, but are unambiguous when coupled with element-specific names introduced in Chapters 4–13.

### 2.4.1 Projections and Parts

- a. **Process:** a bony prominence. The mastoid *process* forms the prominence behind the ear.
- b. **Eminence:** a bony projection; usually not as prominent as a process. The articular *eminence* of the temporal bone is the rounded area with which the mandibular condyle articulates during chewing.
- c. **Spine:** generally a longer, thinner, sharper process than an eminence. Synonymous with **spinous process**. Vertebral *spinous processes* are used in the identification of various vertebrae.
- d. **Tuberosity:** a large, usually rugose (roughened) eminence of variable shape; often a site of tendon or ligament attachment. The deltoid *tuberosity* marks the shaft of the humerus.
- e. **Tubercle:** a small, usually rugose eminence; often a site of tendon or ligament attachment. The conoid *tubercle* is found along the inferior edge of the clavicle.
- f. **Trochanter:** one of two large, prominent, blunt, rugose processes found only on the femur. The larger of these is called the greater *trochanter*, the smaller is the lesser *trochanter*.

- g. **Malleolus** (pl. **malleoli**): a rounded protuberance adjacent to the ankle joint. It is easy to palpate (examine by touch) both lateral and medial *malleoli*.
- h. **Boss**: a smooth, round, broad eminence. Female skulls tend to show more *bossing* of the frontal bone than those of males.
- i. **Articulation**: an area where adjacent bones are in contact (via cartilage or fibrous tissue) at a joint. The proximal surfaces of the tibia are said to *articulate* with the distal end of the femur.
- j. **Condyle**: a rounded articular process. The occipital *condyles* lie on the base of the cranium and articulate with the uppermost vertebra, the atlas.
- k. **Epicondyle**: a nonarticular projection adjacent to a condyle. The lateral *epicondyle* of the humerus is located just proximal to the elbow, adjacent to the lateral condylar surface.
- l. **Head**: a large, rounded, usually articular end of a bone. The *head* of the humerus is the superior (proximal) end of the bone.
- m. **Shaft**, or **diaphysis** (pl. **diaphyses**): the long, straight section between the ends of a long bone. The femoral *shaft* is roughly circular in cross section.
- n. **Epiphysis** (pl. **epiphyses**): in general usage, usually the end portion or extremity of a long bone that is expanded for articulation. The proximal *epiphysis* of the tibia is the expanded end of the bone that articulates with the femur. See Chapter 3 for more precise definitions of the diaphysis, epiphysis, and metaphysis.
- o. **Neck**: the section of a bone between the head and the shaft. The *neck* of the femur is long relative to the size of the femoral head in some early hominids.
- p. **Torus** (pl. **tori**): a bony thickening. The supraorbital *torus* on some *Homo erectus* frontal bones is very thick.
- q. **Ridge**: a linear bony elevation, often roughened. The lateral supracondylar *ridge* of the humerus borders the bone above the lateral epicondyle.
- r. **Crest**: a prominent, usually sharp and thin ridge of bone; often formed between adjacent muscle masses. The sagittal *crest* is a structure on the skull that forms during the development of large *temporalis muscles* in the gorilla.
- s. **Line**: a raised linear surface, not as thick as a torus or as sharp as a crest. The inferior temporal *lines* mark the superior extent of the *temporalis muscles*.
- t. **Hamulus**: a hook-shaped projection. The *hamulus* of the wrist's hamate bone gives the bone its name.
- u. **Facet**: a small articular surface on a bone, or a tooth-to-tooth contact. Bodies of the thoracic vertebrae have *facets* for articulation with the heads of ribs. Occlusal *facets* form on the chewing surfaces of the teeth shortly after crown eruption.
- v. **Ramus** (pl. **rami**): a branch. The pubic bone splits into two *rami* around the obturator foramen.

## 2.4.2 Depressions and Openings

- a. **Fossa** (pl. **fossae**): a depressed area; usually broad and shallow. The olecranon *fossa* is located on the posterior surface of the distal humerus, where it receives the proximal ulna during full extension of the arm.
- b. **Fovea** (pl. **foveae**): a pit-like, depressed area; usually smaller than a fossa. The anterior *fovea* of an unworn molar is seen in occlusal view.
- c. **Groove**: a long pit or furrow. The intertubercular *groove* passes between two tubercles on the humerus.

- d. **Sulcus** (pl. **sulci**): a long, wide groove. A strong supratotal *sulcus* is present on African ape crania but is weak or absent on *Australopithecus* crania.
- e. **Fontanelle**: a space between cranial bones of an infant. The soft spot atop a baby's head indicates the presence of a *fontanelle*.
- f. **Suture**: where adjacent bones of the skull meet (articulate). The lambdoidal *suture* is between occipital and parietal bones.
- g. **Foramen** (pl. **foramina**): an opening through a bone, usually a passage for blood vessels and nerves. The mental *foramen* is an opening on the lateral surface of the mandible.
- h. **Canal**: a tunnel-like passage, usually extending from a foramen. The carotid *canal* is found at the base of the skull.
- i. **Canaliculus** (pl. **canaliculi**): a very small passage or duct. Within compact bone, cells called osteocytes are locally interconnected via a network of *canaliculi*.
- j. **Meatus** (pl. **meati or meatuses**): a short, wide canal. The external acoustic *meatus* is the canal that connects the middle and outer ear.
- k. **Sinus** (pl. **sinuses**): a cavity within a cranial bone. The frontal *sinus* is well-developed in some early hominid crania.
- l. **Alveolus** (pl. **alveoli**): a tooth socket. The canine *alveolus* in the mandible is deeper than the incisor alveolus.

## 2.5 Useful Prefixes and Suffixes

- a. **A-**: without, or not (Greek). Cartilage is *avascular* in adults.
- b. **Allo-**: other or different (Greek). Changes in body proportions occur as a result of *allometric* growth, *i.e.*, different body parts growing at different rates.
- c. **Ante-**: before, ahead of, preceding, or in front of (Latin). *Antemortem* injuries occur before the death of the individual.
- d. **Anti-**: opposite or against (Greek, contrasts with *pro-*). Because of lateral symmetry, each right bone has a left *antimere*.
- e. **Apo-**: separate, apart, away from, or detached (Greek). Secondary growth centers at sites of muscular insertions are called *apophyses*, or traction epiphyses.
- f. **Basi-**: of, or relating to the bottom or base (Latin, *basis*, base, pedestal). The bottom of the cranium is referred to as the *basicranium*.
- g. **Bi-**: twice, double, on both sides, in both directions, between both (Latin, see also *di-*). The osteometric measurement 'bi-iliac breadth' is often used as a proxy (or surrogate) for body width.
- h. **Brachi-, brachio-, or -brachial**: of, or relating to the arm, specifically the upper arm (Latin, *brachialis*, from *brachium*, arm). The *brachioradialis* muscle reaches from the humerus to the radius. Do not confuse with *brachy-*.
- i. **Brachy-**: short (Greek, *brakhus*, short). A cranium that is short (front-to-back) relative to its width (side-to-side) is considered to be *brachycephalic*. Do not confuse with *brachi-*.
- j. **-cep-, -ceps**: head or heads (Latin, *ceps*, from *caput*, head). The *biceps brachii* muscle has two distinct heads, each originating from a different part of the scapula.
- k. **Chondro- or -chondro-**: cartilage or cartilaginous (Greek, *khondros*, grain or cartilage). *Chondroblasts* are cartilage-forming cells.
- l. **Circum-**: around (Latin). The action of swinging your arm in a large circle is called *circumduction*.



- m. **Con-**: with or together (Latin). A disease present from birth is called a *congenital* disease.
- n. **Cost-** or **-costal**: related to a rib or ribs (Latin, *costa*, rib). The *costoclavicular* ligament runs between the clavicle and the first rib.
- o. **Cyt-**, **-cyte**, or **-cytic**: a mature cell (Greek, *kutos*, vessel). *Osteocytes* are found in *lacunae* (small spaces in the bone in which living bone cells live), trapped by the very matrix they have secreted.
- p. **Demi-**: half (Latin). The sixth thoracic vertebra has both superior and inferior *demifacets*.
- q. **Di-**: twice or double (Greek, see also *bi-*). The *digastric* muscle is named for its two bellies.
- r. **Dia-**: across, through, or apart (Greek). A long bone's *diaphysis* reaches from one epiphysis to the other.
- s. **Dis-**: undoing, removal, reversal, or absence (Latin). When part of a joint is separated from the rest of the joint, it is referred to as a *dislocation*.
- t. **Ecto-**: outside (Greek, contrasts with *endo-*). *Button sarcomas*, small cancerous lesions, are frequently found on the *ectocranial* surface of the cranial vault.
- u. **Endo-**: inside (Greek, contrasts with *ecto-*). *Endocranial* capacity is often used as a proxy for brain size in skeletal remains.
- v. **Epi-**: at, upon, close to, adjacent, above, or in addition (Greek). The bony endplates of a growing bone are called *epiphyses*.
- w. **-form**, **-iform**: having the shape or form of (Latin). The *piriform* aperture is an opening roughly in the shape of a pear.
- x. **Hemi-**: half (Greek, similar to *semi-*). The humeral head is only *hemispheric*, while the femoral head is much closer to spherical.
- y. **Hetero-**: other, or different (Greek, contrasts with *homo-*). Humans, like most mammals, have complex and differentiated teeth, a trait called *heterodonty*.
- z. **Homo-**: similar, same, or identical (Greek, contrasts with *hetero-*). The vertebral column is made up of a set of serially *homologous* elements.
- aa. **Hypo-**: less than, under, beneath, below, or to a lesser degree (Greek, contrasts with *hyper-*. See also *sub-*). The *hypoglossal* nerve enters the underside of the tongue.
- ab. **Hyper-**: more than, over, beyond, above, or to a greater degree (Greek, contrasts with *hypo-*; see also *super-*). The radial tuberosity was enlarged and roughened, probably in response to a hypertrophied *biceps brachii* muscle.
- ac. **Infra-**: below or beneath (Latin). The *infraorbital* foramen opens beneath the eye socket.
- ad. **Inter-**: between. An *interosseous* membrane connects the shafts of the tibia and the fibula.
- ae. **-itis**: denotes an inflammatory disease (Greek). *Osteitis* is an inflammation of bony tissue.
- af. **Lacri-/lacry-**: of, belonging to, or related to tears (Latin, *lacrima*, "tear"). The *nasolacrimal* duct drains tears into the nasal cavity.
- ag. **Meso-**: intermediate, medium (Greek, *mesos*, middle). The *mesosternum* is referred to as the corpus sterni.
- ah. **Meta-**: between or with (Greek). The *metaphysis* is an area of growth sandwiched between the epiphysis and the diaphysis.
- ai. **Neuro-**: related to the brain or central nervous system (Greek, *neuron*, nerve or sinew). The *neurocranium* is that part of the cranium that houses the brain.
- aj. **-oma** (pl. **-omata**): growth or tumor. (Latin, from Greek) An *osteoma* is a bone tumor.
- ak. **Ortho-**: straight or upright (Greek). An animal whose trunk is kept habitually upright is said to have *orthograde* posture.
- al. **-osis**: designates a disease, condition, or disorder (Greek). *Osteoporosis* is a condition in which bone becomes less dense (*i.e.*, more porous).

- am. **Osteo-** or **-osteo-**: of, or relating to, bones (Greek, *osteon*, “bone”). The study of bones is called *osteology*.
- an. **Para-**: beside, next to, or parallel to (Greek). A body has only one sagittal plane, but it may have an infinite number of *parasagittal* planes.
- ao. **Peri-**: near, around, or about (Greek). The membrane that tightly covers a bone is called the *periosteum*.
- ap. **-physis** (pl. **-physes**): a growth, projection, or protuberance (Greek). The rear articular surfaces of vertebrae extend towards their neighbors on *zygapophyses*.
- aq. **-phyte**: a pathological outgrowth (Greek, *phyton*, “plant”). Abnormal bony outgrowths are called *osteophytes*.
- ar. **Platy-**: broad and flat (Greek). Side-to-side flattening of the tibia is called *platynemia*.
- as. **Pre-**: before — with respect to location, time, degree, or importance (Latin). The vertebrae above the sacrum are referred to collectively as *presacral* vertebrae.
- at. **Proto-**: first, largest, primary, most important (Greek, *protos*, first). The *protocone* dominates the other molar cusps.
- au. **Retro-**: having a location behind (Latin, *retro*, backward). Neanderthals have a *retromolar* sulcus behind their lower wisdom tooth.
- av. **Semi-**: half or partly (Latin, similar to *hemi-*). The *semicircular* canals of the middle ear house the organs of balance.
- aw. **Splanchno-**: related to the viscera or internal organs (latinized Greek). The part of the cranium that encases the beginnings of the digestive and respiratory systems is called the *splanchnocranium*.
- ax. **-stitial**: related to a place where something stands (Latin, *sistere*, to stand). Bone growth that happens between the epiphyses and pushes them apart is called *interstitial* bone growth.
- ay. **Sub-**: under, below, beneath, or less than (Latin, see also *hypo-*). The *subclavius* muscle attaches to the underside of the clavicle.
- az. **Super-**: above, extra, beyond, in addition, or greater than (Latin, see also *hyper-*). There are usually only three molars per side and per arch. Occasionally, an additional molar will develop; these are called *supernumerary* molars.
- ba. **Supra-**: above, beyond, in addition (Latin, related to *super-*). The *supraspinous* fossa, as its name suggests, is a depression found above the scapular spine.
- bb. **Syn-**: similarly, alike, or together (Latin, *syn*, from Greek *sun*, together). Cranial sutures are one kind of *synarthrosis* — a nearly immovable articulation — where bones are held together by fibrous connective tissue.
- bc. **-topic**: place or usual location (Greek, *-topia*, from *topos*, place). *Heterotopic* ossification is a condition in which bone tissue is formed in places in the body other than the skeleton.
- bd. **-trophy**: maintenance, nourishment (Greek, *trophia*, nourishment). If muscles are not used, they *atrophy*; if heavily used, they *hypertrophy*.
- be. **Tri-**: having three parts (Latin, *tri*, three). The *triceps* brachialis muscle has three heads, each originating from a different location but all merging into a single insertion.
- bf. **Zygo-**: denoting a joining or pairing (Greek, *zugon*, “yoke”). There are two *zygomatic* bones, one at each side of the face.

## 2.6 Anatomical Regions

There are many specific terms for anatomical regions or parts of the body that, once learned, will help you make sense of the countless anatomical terms to which they contribute.

- a. **Antebrachial:** of, belonging to, or related to the forearm (Latin, *ante* + *brachium*, before the arm).
- b. **Antecubital:** of, belonging to, or related to the front of the elbow (Latin, *ante* + *cubitus*, before the elbow).
- c. **Axillary:** of, belonging to, or related to the armpit (Latin, *axilla*, armpit). Do not confuse *axillary* with *axial*.
- d. **Brachial:** of, belonging to, or related to the arm, specifically the upper arm (Latin, *brachium*, arm).
- e. **Buccal:** of, belonging to, or related to the cheek (Latin, *bucca*, cheek).
- f. **Carpal:** of, belonging to, or related to the wrist (Latin, *carpus*, wrist).
- g. **Cephalic:** of, belonging to, or related to the head (Greek, *kephale*, head).
- h. **Cervical:** of, belonging to, or related to the neck (Latin, *cervix*, neck).
- i. **Cnemial:** of, belonging to, or related to the shin or tibia (Greek, *cnem*, tibia).
- j. **Costal:** of, belonging to, or related to the ribs (Latin, *costa*, rib).
- k. **Coxal:** of, belonging to, or related to the pelvis, hip, or hip-joint (Latin, *coxa*, hip).
- l. **Crural:** of, belonging to, or related to the leg, specifically the lower leg or calf (Latin, *crus*, leg).
- m. **Cubital:** of, belonging to, or related to the elbow (Latin, *cubitus*, elbow).
- n. **Cutaneous:** of, belonging to, or related to the skin (Latin, *cutis*, skin).
- o. **Dermal:** of, belonging to, or related to the skin (Greek, *derma*, skin).
- p. **Digital:** of, belonging to, or related to the finger(s) or toe(s) (Latin, *digitus*, finger).
- q. **Dorsal:** of, belonging to, or related to the back (Latin, *dorsum*, back).
- r. **Femoral:** of, belonging to, or related to the leg, specifically the thigh, or upper leg (Latin, *femur*, thigh).
- s. **Glossal:** of, belonging to, or related to the tongue (Greek, *glossus*, tongue).
- t. **Hallucial:** of, belonging to, or related to the big toe (Latin, *allex*, big toe).
- u. **Lingual:** of, belonging to, or related to the tongue (Latin, *lingua*, tongue or language).
- v. **Lumbar:** of, belonging to, or related to the loin, or lower back (Latin, *lumbus*, loin).
- w. **Manual:** of, belonging to, or related to the hand (Latin, *manus*, hand).
- x. **Mental:** of, belonging to, or related to the chin (Latin, *mentum*, chin).
- y. **Nasal:** of, belonging to, or related to the nose (Latin, *nasale*, nose).
- z. **Neural:** of, belonging to, or related to the brain or nervous system (Greek, *neuron*, nerve).
- aa. **Nuchal:** of, belonging to, or related to the nape, or back of the neck (Latin, *nucha*, neck or spinal cord).
- ab. **Orbital:** of, belonging to, or related to the eye socket (Latin, *orbita*, eye socket).
- ac. **Patellar:** of, belonging to, or related to the front of the knee (Latin, *patella*, kneecap).
- ad. **Pedal:** of, belonging to, or related to the foot (Latin, *pes*, foot).
- ae. **Pollical:** of, belonging to, or related to the thumb (Latin, *pollex*, thumb, big toe).
- af. **Popliteal:** of, belonging to, or related to the back of the knee (Latin, *popliteus*, back of the knee).

- ag. **Tarsal:** of, belonging to, or related to the ankle (Latin, *tarsus*, ankle).
- ah. **Temporal:** of, belonging to, or related to the temples (Latin *temporalis*, from *tempus* or *tempor-*, time: so named because one of the hallmarks of age is gray hair at the temples).
- ai. **Thoracic:** of, belonging to, or related to the chest (Latin from Greek, *thorax*, breast-plate, cuirass, chest, or breast).
- aj. **Vascular:** of, belonging to, or related to vessels, specifically blood vessels (Latin, *vascularis*, from *vasculum*, a diminutive of *vas*, vessel).

## 2.7 Shape-related Terms

A number of terms are used by anatomists and osteologists to describe the shape of anatomical structures.

- a. **Ala** (pl. **alae**): in the shape of a wing (Latin, *ala*, wing).
- b. **Arch:** in the shape of a simple, symmetrical curved line (Latin, *arcus*).
- c. **Bifid:** split into two parts by a cleft or notch (Latin: *bi*, two, and *fid-*, from *findre*, to cleave or split). See *bifurcated*.
- d. **Bifurcated:** split into two branches or forks (Latin, *bifurcus*, two-forked). See *bifid*.
- e. **Bilobate:** composed of two distinct (but connected) lobes or blunt projections.
- f. **Cervix/Cervical:** restricted or constricted (Latin, *cervix*, neck).
- g. **Concave:** having a profile or a surface that curves inward (Latin, *con-*, together, and *cavus*, hollow).
- h. **Conoid:** having a cone-like shape (Greek, *konoeides*, from *conus*, cone, and *-eidos*, form).
- i. **Convex:** having a profile or a surface that curves outward (Latin, *convexus*, vaulted, arched).
- j. **Coracoid:** shaped like a raven's beak (Greek, *korakoeides*, from *korax*, raven).
- k. **Coronoid:** hook-shaped (Greek).
- l. **Crenulate:** finely wrinkled, notched, or undulating (French, *crenel*, from Latin *crena*, notch).
- m. **Cristal:** crested, in the shape of a crest (Latin, *crista*, tuft, plume, crest).
- n. **Cruciate:** crossed, or cross-shaped (Latin *cruciatus*, from *crux*, *cruc-*, cross, and *-atus*, adjectival ending; see also *cruciform*).
- o. **Cruciform:** in the shape of a cross (Latin *crux*, *cruc-*, cross, and *-iform*, shaped; see also *cruciate*).
- p. **Cuneiform:** in the shape of a wedge (Latin, *cuneiformis*, from *cuneus*, wedge).
- q. **Deltoid:** in the shape of the Greek letter Δ (*delta*); *i.e.*, having a triangular shape or outline.
- r. **Hamate:** hook-shaped (Latin; see also *uncinate*). The hamate bone has a process which helps enclose the carpal tunnel.
- s. **Helical:** in the shape of a helix (latinized Greek, *helix*, screw-shaped).
- t. **Hemispherical:** a spherical object cut exactly in half results in two hemispherical objects.
- u. **Interdigitated:** intricately joined together (articulated), as when fingers are woven together.
- v. **Lambdoid:** in the shape of the Greek letter λ (*lambda*), much like an inverted 'Y'
- w. **Laminar:** wall-like; usually applied to thin, vertical structures (Latin, *lamina*, thin plate).
- x. **Lentiform:** in the shape of a lentil; lens-shaped (Latin, *lent-*, lentil, and *-iform*, shaped).
- y. **Lobate:** having a lobe or lobes (Latin, *lobus*, a round projecting part).

- z. **Lunate:** shaped like a crescent, esp. like a crescent moon (Latin *luna*, moon).
- aa. **Navicular:** in the shape of a boat (Latin *navicula*, little boat).
- ab. **Obturator:** obstructed; closed or blocked off (Latin, *obturare*, to obstruct).
- ac. **Ovoid:** in the shape of an oval (Latin, *ovoides*, from *ovum*, egg).
- ad. **Parabolic:** in the shape of a parabola; a symmetrical curving line whose branches get gradually and increasingly close to parallel without ever becoming parallel (Latinized Greek, *parabole*, from *para*, beside, and *bole*, a throw).
- ae. **Pisiform:** in the shape of a pea (Latin, *pisiformis*, pea-shaped).
- af. **Quadrangle:** rectilinear; in the general shape of a rectangle or square; *i.e.*, having four sides joining at 90° angles (Latin, *quadratus*, made square, from *quattuor*, four).
- ag. **Rectus:** in a straight line; straight, linear (Latin, *rectus*, straight).
- ah. **Rhomboid:** shaped like a rhombus (any parallelogram besides a square or rectangle) (Latinized Greek, *rhombos*).
- ai. **Sellar:** having a saddle shape (Latin, *sella*, seat or saddle).
- aj. **Sesamoid:** shaped like a sesame seed (Latinized Greek, *sesamon*, sesame seed).
- ak. **Sigmoid:** in the shape of the Greek letter 'S' (Σ, *sigma*). Recursively curving, like a snake.
- al. **Spherical:** having the shape of a perfectly round ball (Latinized Greek, *sphairikos*, from *sphaira*, sphere).
- am. **Squamous:** scale-like; in the form of a reptile's scale (Latin, *squamosus*, from *squama*, scale).
- an. **Stenotic:** abnormally narrowed or constricted (used for passages and internal spaces) (Latinized Greek, *stenos*, narrow).
- ao. **Toroidal:** a wide ridge or shelf that is semi-circular or bulging in cross section (Latin, *torus*, swelling).
- ap. **Trochlear:** spindle- or spool-shaped (Latin, *trochlea*, pulley). In the shape of a pulley, grooved in the center and raised on the edges.
- aq. **Uncinate:** hook-shaped (Latin, *uncinatus*, from *uncinus*, hook; see also *hamate*).
- ar. **Vault:** the arched roof of a cavity (Old French *voute*, from Latin, *volvere*, to roll).

## Suggested Further Readings

Virtually all texts in human anatomy provide guides to anatomical terminology.

Bass, W. M. (2005) *Human osteology: A laboratory and field manual* (5th ed.). Columbia, MO: Missouri Archaeological Society. 365 pp.

Appendices for the osteology student are concise sources of information on bone nomenclature.

Dauber, W., and Feneis, H. (2007) *Pocket atlas of human anatomy: Founded by Heinz Feneis* (5th ed.). New York, NY: Thieme. 545 pp.

A comprehensive reference, thoroughly aligned with the latest terminology of the Federative Committee on Anatomical Terminology.

Federative Committee on Anatomical Terminology. (1998) *Terminologia Anatomica: International anatomical terminology*. New York, NY: Thieme. 292 pp. + CD-ROM.

This work revises the international standards for anatomical nomenclature, superseding all editions of the *Nomina Anatomica*.

Kachlik, D., Baca, V., Bozdechova, I., Cech, P., and Musil, V. (2008) Anatomical terminology and nomenclature: Past, present and highlights. *Surgical and Radiologic Anatomy* 30:459–466.

A history of modern systems of anatomical terminology, from the *Basiliensia Nomina Anatomica* of 1895 to the most recent revision, the *Terminologia Anatomica* of 1998.

Lisowski, F. P., and Oxnard, C. E. (2007) *Anatomical terms and their derivation*. Hackensack, NJ: World Scientific Publishing. 136 pp.

A pocket-sized guide to anatomical terminology, providing a means to better understand those terms by exploring their origins in Greek and Latin words.

O’Rahilly, R. (1989) Anatomical terminology, then and now. *Acta Anatomica* 134:291–300.

A good history of the first 25 centuries of anatomical nomenclature.

Sakai, T. (2007) Historical evolution of anatomical terminology from ancient to modern. *Anatomical Science International* 82:65–81.

A comprehensive investigation of systems of organizing and naming anatomical structures created over the past 1800 years.